UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/807,259	03/24/2004	Atsushi Watanabe	392.1885	4225

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STAAS & HALSEY LLP	EXAMINER	
SUITE 700	PARK, EDWARD	
1201 NEW YORK AVENUE, N.W.		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL.**　　　2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☒ All　b)☐ Some * c)☐ None of:

　　　1.☒ Certified copies of the priority documents have been received.

　　　2.☐ Certified copies of the priority documents have been received in Application No. _____ .

　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-SB/08)
　　Paper No(s)/Mail Date *See Continuation Sheet*.

4)☐ Interview Summary (PTO-413)
　　Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____ .

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :3/24/04, 9/29/05, 4/18/06, 7/12/06.

DETAILED ACTION

Specification

1.   The title of the invention is not descriptive. A new title is required that is clearly

indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

2.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3.   **Claims 1, 2, 3, 7, 8** are rejected under 35 U.S.C. 102(b) as being anticipated by Watanabe

et al (EP 1043689 A2).

Regarding **claim 1**, Watanabe teaches an image processing device for determining three-

dimensional position and/or orientation of an object, comprising:

image data capturing means for capturing image data containing an image of the object

(Watanabe: figure 1, numeral 20);

model pattern creating means for creating a model pattern based on image data of a reference object with a reference orientation relatively to said image capturing means captured by said image capturing means, said reference object having a shape substantially identical to that of the object (Watanabe: figure 5, numeral 102);

transformation means for performing two-dimensional and geometrical transformation of the created model pattern to generate a transformed model pattern representing an image of the object with an orientation different from the reference orientation (Watanabe: figure 5, numeral 103);

pattern matching means for performing a pattern matching of the image data of the object captured by said image capturing means with the transformed model pattern (Watanabe: figure 6, numeral 203);

selecting means for repeatedly performing the generation of a transformed model pattern and the pattern matching of the image data of the object with the transformed model pattern to thereby select one of the transformed model patterns in conformity with the image data of the object, and obtain information on a position of the image of the object in the image data (Watanabe: figure 6, numerals 204-208); and

determining means for determining three-dimensional position and/or orientation of the object based on the information on the position of the image of the object in the image data and information on the orientation of the selected one of the transformed model patterns (Watanabe: figure 6, numeral 209).

Regarding **claim 2**, Watanabe teaches an image processing device for determining three-dimensional position and/or orientation of an object, comprising:

image data capturing means for capturing image data containing an image of the object (Watanabe: figure 1, numeral 20);

model creating means for creating a model pattern based on image data of a reference object with a reference orientation relative to said image data. capturing means captured by said image data capturing means, said reference object having a shape substantially identical to that of the object (Watanabe: figure 5, numeral 102);

transformation means for performing two-dimensional and geometrical transformation of the created model pattern to generate a plurality of transformed model patterns each representing an image of the object with an orientation different from the reference position (Watanabe: figure 5, numeral 103);

storage means for storing the plurality of transformed model patterns and information on orientations of the respective transformed model patterns (Watanabe: figure 5, numeral 102, 103);

pattern matching means for performing pattern matching of the image data of the object captured by said image capturing means with the plurality of transformed model patterns to thereby select one of the transformed model patterns in conformity with the image data of the object (Watanabe: figure 6, numerals 203-208), and obtain information on a position of the image of the object in the image data (Watanabe: figure 6, numerals 209); and

determining means for determining three-dimensional position and/or orientation of the object based on information on the position of the image of the object in the image data and the information on an orientation of the selected one of the transformed model patterns (Watanabe: figure 6, numeral 209).

Regarding **claim 3**, Watanabe teaches a two-dimensional and geometrical transformation of an affine transformation ("world coordinate system is obtained by an arithmetic operation of coordinate transformation using the data of the position/posture of the workpiece W in the camera coordinate system and the position/posture of the camera 20 in the world coordinate system"; Watanabe: paragraph [0042]), and said image processing device further comprises additional measuring means for obtaining a sign of inclination of the object with respect to said image capturing means ("position/posture of the workpiece in the camera coordinate system is stored as [x0, y0, z0, α0, β0, γ0]c, where α, β, and γ mean rotation angle around X-, Y-, Z- axes, and 'c' means the camera coordinate system"; Watanabe: paragraph [0033]).

Regarding **claim 7**, Watanabe teaches a storage means storing an operating orientation of the robot relative to the object or storing an operating orientation and an operating position of the robot relative to the object ("when a picking-up command is inputted .... three dimensional position/posture of the camera 20 on the world coordinate system at this image capturing position is outputted to the image processing apparatus 30"; Watanabe: paragraph [0040]); and robot control means for determining an operating orientation of the robot or the operating orientation and an operating position of the robot based on the determined three-dimensional position and/or orientation of the object ("robot controller 10 operates the robot to perform a pick-up operation .... based on the three-dimensional position/posture of the workpiece W (Step 210)"; Watanabe: paragraph [0044]).

Regarding **claim 8**, Watanabe teaches an image capturing means mounted on the robot (Watanabe: figure 1, numeral 20).

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

5.   **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination

of Watanabe et al (EP 1043689 A2) with Maeda et al (US 2003/0161537 A1), and further in

view of Inoue (US 2003/0161504 A1).

Regarding **claim 4**, Watanabe discloses all elements as mentioned above in claim 3.

Watanabe does not teach dividing of a model pattern into at least two partial model patterns

which are subject to the affine transformation to generate transformed partial model patterns, and

pattern matching of the image data of the object with the transformed partial model patterns to

determine most conformable sizes, and determines the sign of the inclination based on

comparison of the sizes of the conformable partial model patterns with each other.

Maeda teaches a pattern matching of the image data of the object with the transformed

model patterns to determine most conformable sizes, and determines the sign of the inclination

based on comparison of the sizes of the conformable model patterns with each other (Maeda:

figure 1, numeral 32).

It would have been obvious at the time the invention was made to one of ordinary skill in

the art to modify the Watanabe reference to determine the sign of the inclination based on

comparison of the sizes of the conformable partial model patterns with each other as suggested

by Maeda, to allow the imaging device to accurately identify "a three-dimensional object using

images obtained by photographing the object in the various directions" (Maeda: paragraph

[0004]).

The Watanabe with Maeda combination as applied above does not teach dividing of a

model pattern into at least two partial model patterns which are subject to the affine

transformation to generate transformed partial model patterns.

Inoue teaches dividing of a model pattern into at least two partial model patterns (Inoue:

figure 2, numeral 302, 303), which are subject to the affine transformation ("affine

transformation"; Inoue: paragraph [0107]) to generate transformed partial model patterns.

It would have been obvious at the time the invention was made to one of ordinary skill in

the art to modify the Watanabe with Maeda combination as applied above, to utilize partial

model patterns as suggested by Inoue, to further "correctly classify the input image regardless of

a fluctuation in illumination, and a state of occlusion" (Inoue: paragraph [0012]).

6.   **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al

(EP 1043689 A2) in view of Okisu et al (US 6,806,903 B1).

Regarding **claim 5**, Watanabe discloses all elements as mentioned above in claim 3.

Watanabe does not teach a measurement of distances from a displacement sensor separately

provided in the vicinity of said image capturing means to at least two points on the object using

the displacement sensor, and determines the sign of the inclination based on comparison of the

measured distances.

Okisu teaches a measurement of distances from a displacement sensor separately

provided in the vicinity of said image capturing means to at least two points on the object using

the displacement sensor, and determines the sign of the inclination based on comparison of the

measured distances ("measure distance to two separate portions of an object from the electronic

camera, and calculate an angle of inclination θ based on measure two distances"; Okisu: col. 19,

lines 54-57).

It would have been obvious at the time the invention was made to one of ordinary skill in

the art to modify the Watanabe reference to determine the sign of the inclination based on

comparison of the measured distances as suggested by Okisu, to allow the image processing

device to properly focus with high degree of accuracy on the targeted object for image capturing.

7.   **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al

(EP 1043689 A2) in view of Maeda et al (US 2003/0161537 A1).

Regarding **claim 6**, Watanabe discloses all elements as mentioned above in claim 3.

Watanabe further teaches an additional pattern matching of image data of the object captured

after said image data capturing means is slightly moved or inclined ("camera may be moved

parallelly in accordance with the position of the workpiece in the field of view of the camera";

Watanabe: paragraph: [0048]). Watanabe does not teach determining the sign of the inclination

based on judgment whether an inclination of image of the object becomes larger or smaller than

the selected one of the transformed model patterns.

Maeda teaches determining the sign of the inclination based on judgment whether an

inclination of image of the object becomes larger or smaller than the selected one of the

transformed model patterns (Maeda: figure 1, numeral 32).

It would have been obvious at the time the invention was made to one of ordinary skill in

the art to modify the Watanabe reference to determine the sign of the inclination based on

judgment whether an inclination of image of the object becomes larger or smaller than the

selected one of the transformed model patterns as suggested by Maeda, to allow the imaging

device to accurately identify "a three-dimensional object using images obtained by

photographing the object in the various directions" (Maeda: paragraph [0004]).

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Edward Park whose telephone number is (571) 270-1576. The

examiner can normally be reached on M-F 10:30 - 20:00, (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Brian Werner can be reached on (571) 272-7401. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

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like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Edward Park
Examiner
Art Unit 2609

/Edward Park/

/Brian P. Werner/
Supervisory Patent Examiner (SPE), Art Unit 2624